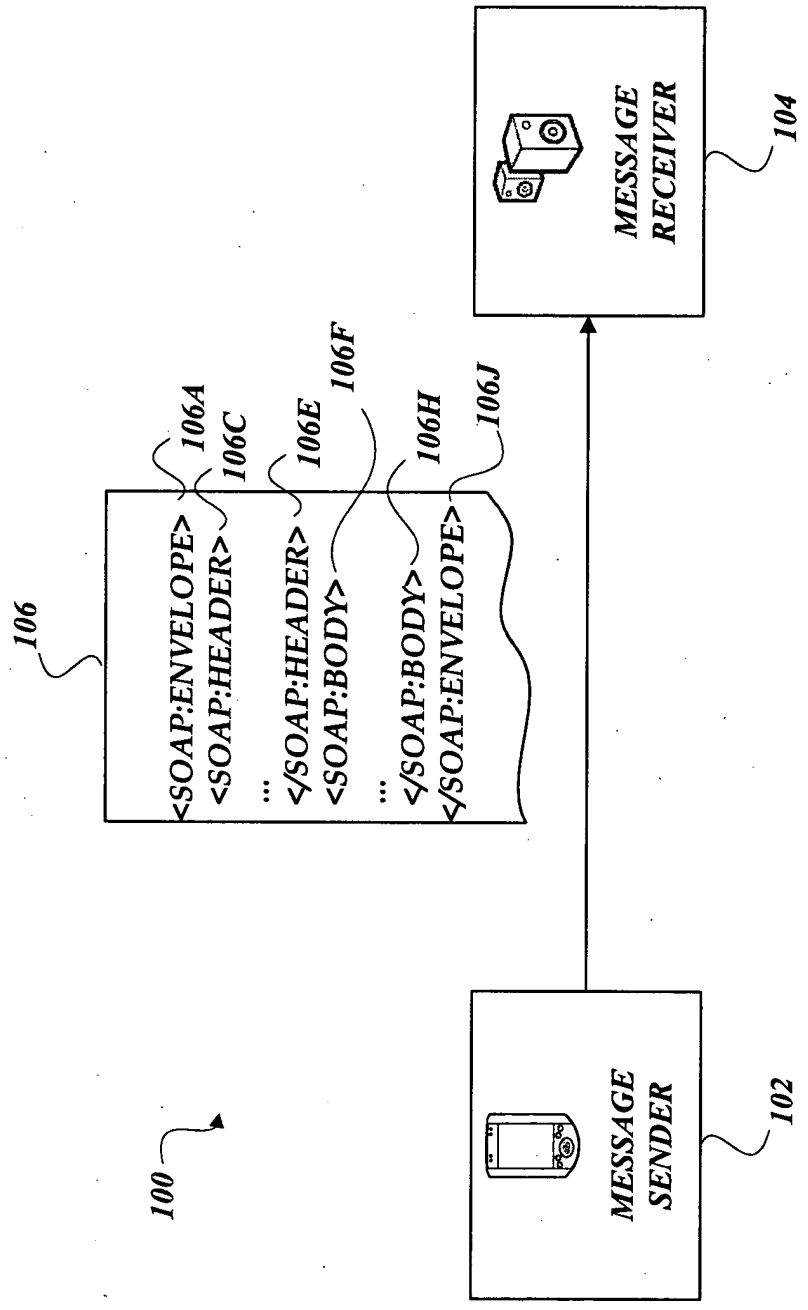
100
MESSAGE SENDER
102
MESSAGE RECEIVER
104
106
106A
106C
106E
106F
106H
106J
<SOAP:ENVELOPE>
<SOAP:HEADER>
...
</SOAP:HEADER>
<SOAP:BODY>
...
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</SOAP:ENVELOPE>

Fig.1.

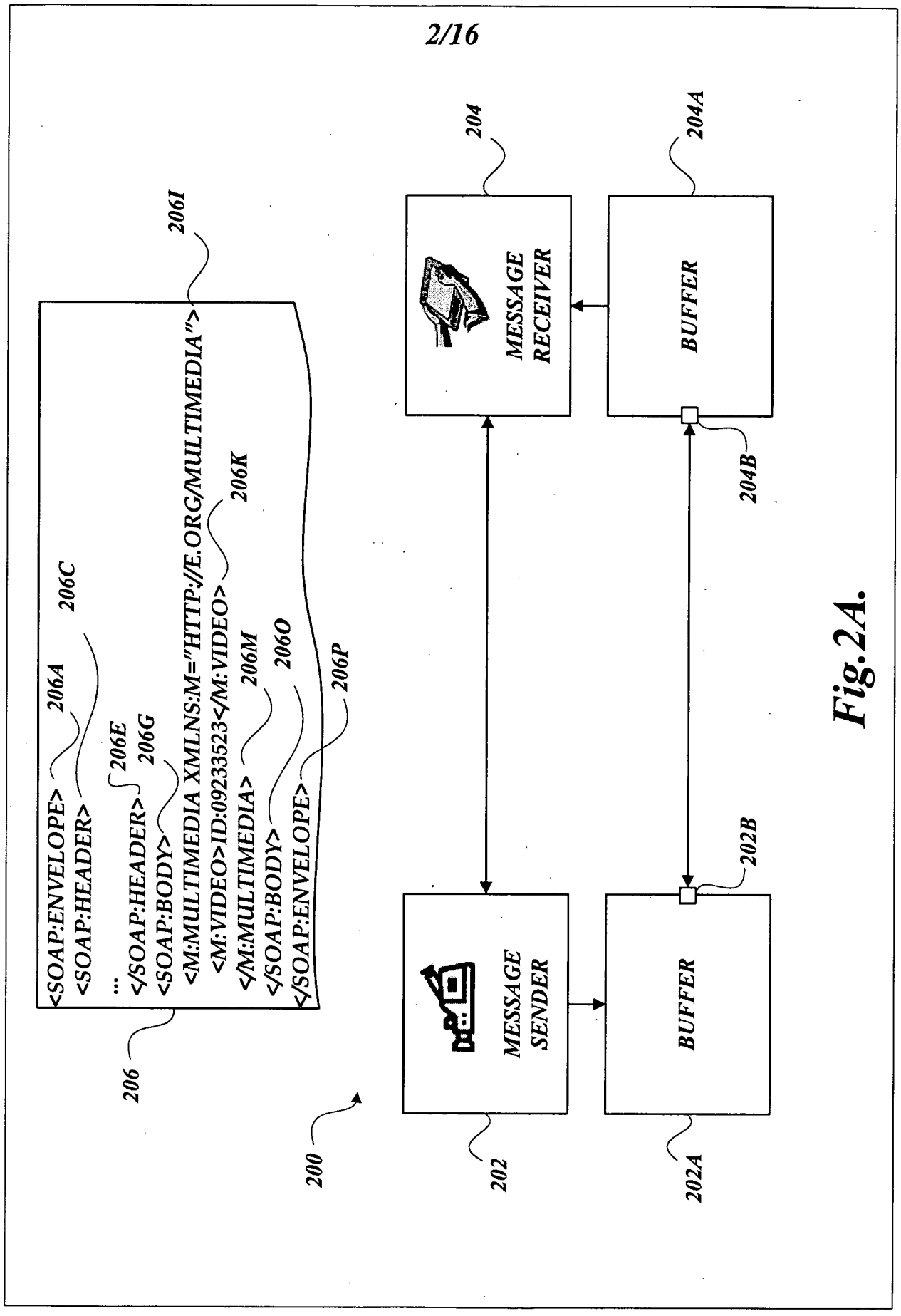
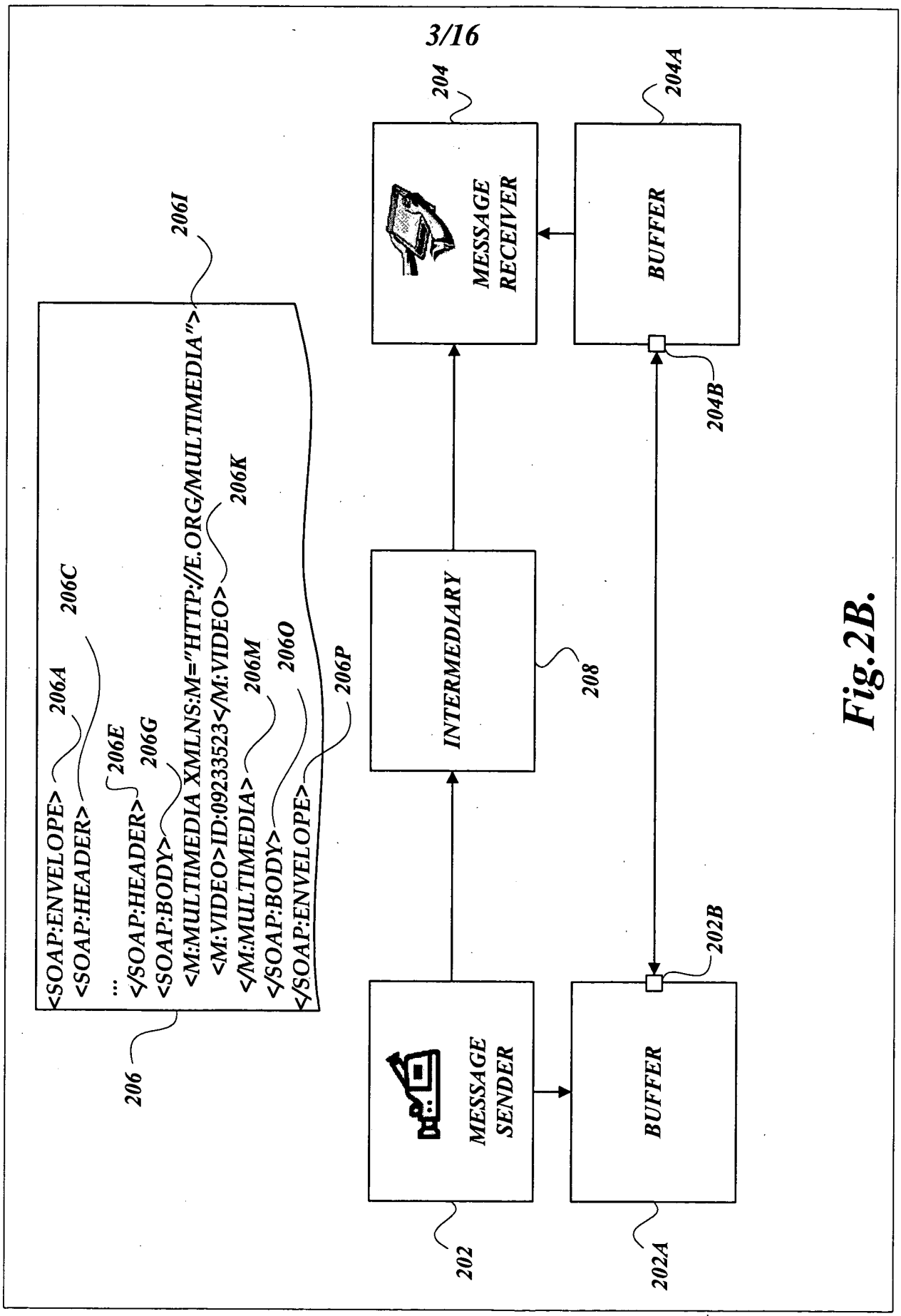

206I
<SOAP:ENVELOPE>
206A
206C
<SOAP:HEADER>
...
206E
</SOAP:HEADER>
206G
<SOAP:BODY>
<M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">
206K
<M:VIDEO>ID:09233523</M:VIDEO>
206M
</M:MULTIMEDIA>
206O
</SOAP:BODY>
206P
</SOAP:ENVELOPE>
206
200
204
MESSAGE RECEIVER
204A
BUFFER
204B
202B
MESSAGE SENDER
BUFFER
202
202A

Fig.2A.


206I
206A
206C
206E
206G
206K
206M
206O
206P
206
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<M:VIDEO>ID:09233523</M:VIDEO>
</M:MULTIMEDIA>
</SOAP:BODY>
</SOAP:ENVELOPE>
204
MESSAGE RECEIVER
204A
BUFFER
204B
INTERMEDIARY
208
202B
MESSAGE SENDER
BUFFER
202
202A

Fig.2B.

Title: SEND BY REFERENCE IN A CUSTOMIZABLE, TAG-BASED PROTOCOL
Inventors: David G. Conroy et al.
Docket No.: MSFT121951

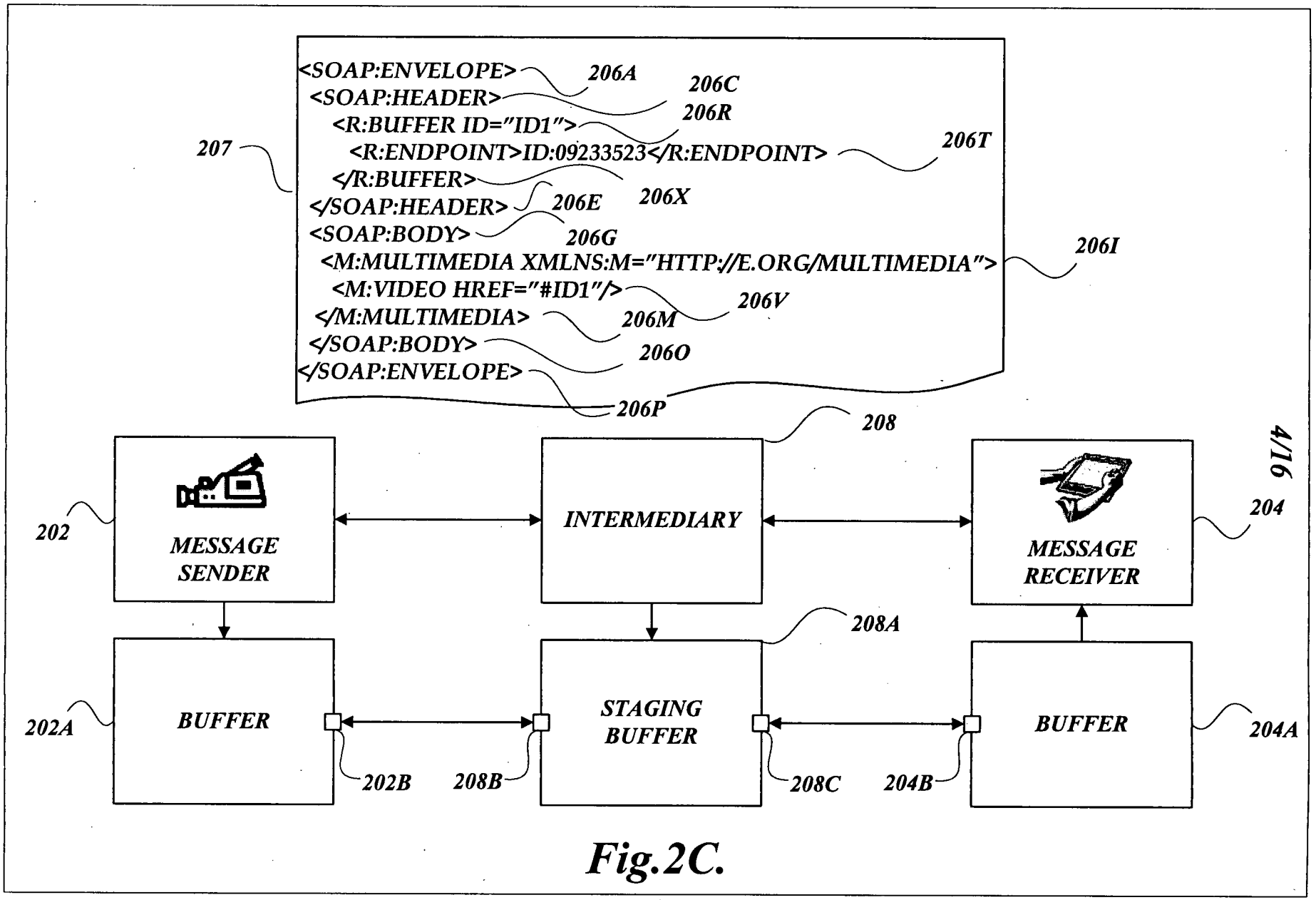


Fig.2C.

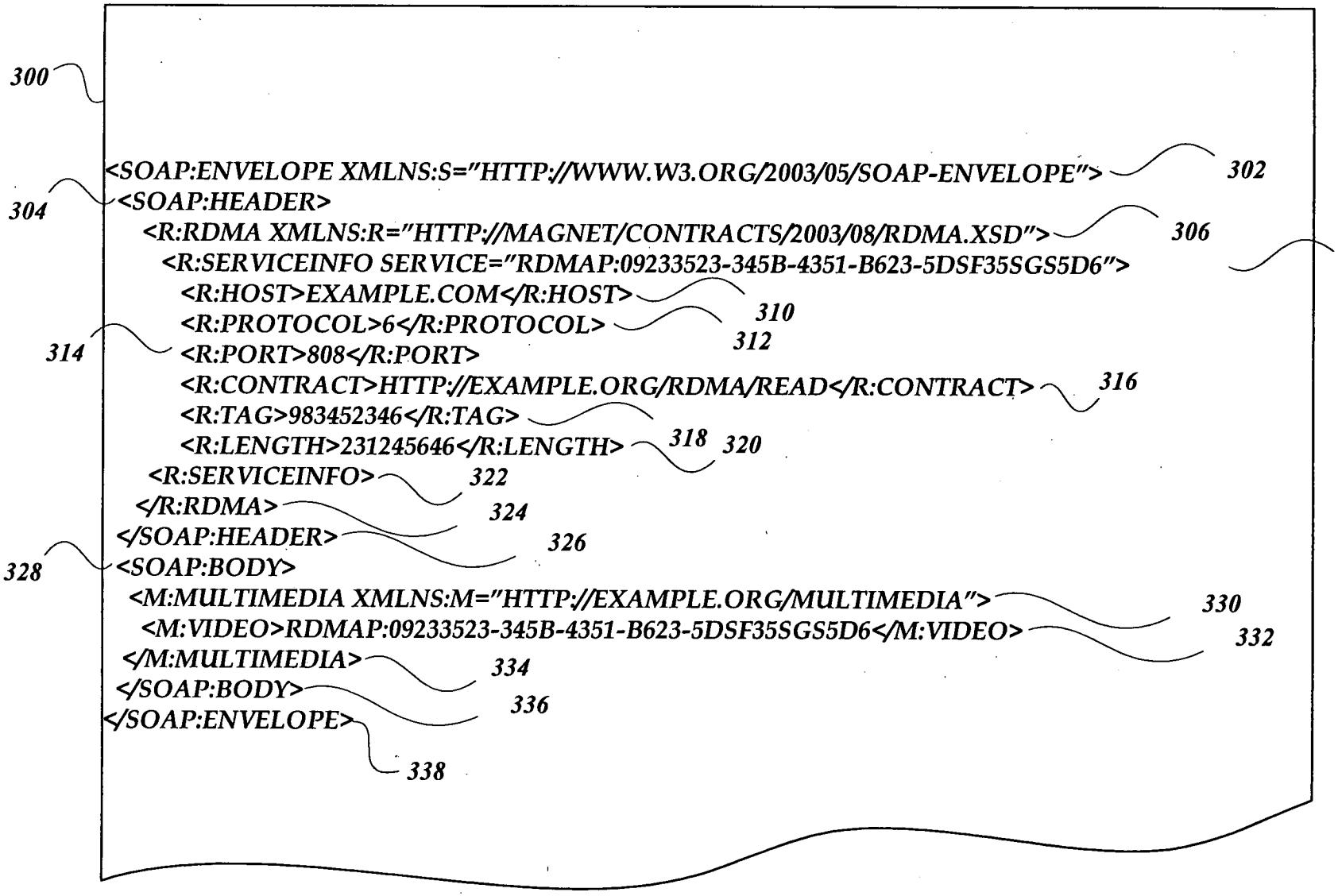


Fig.3.

DRAFT

Title: SEND BY REFERENCE IN A CUSTOMIZABLE, TAG-BASED PROTOCOL
Inventors: David G. Conroy et al.
Docket No.: MSFT121951

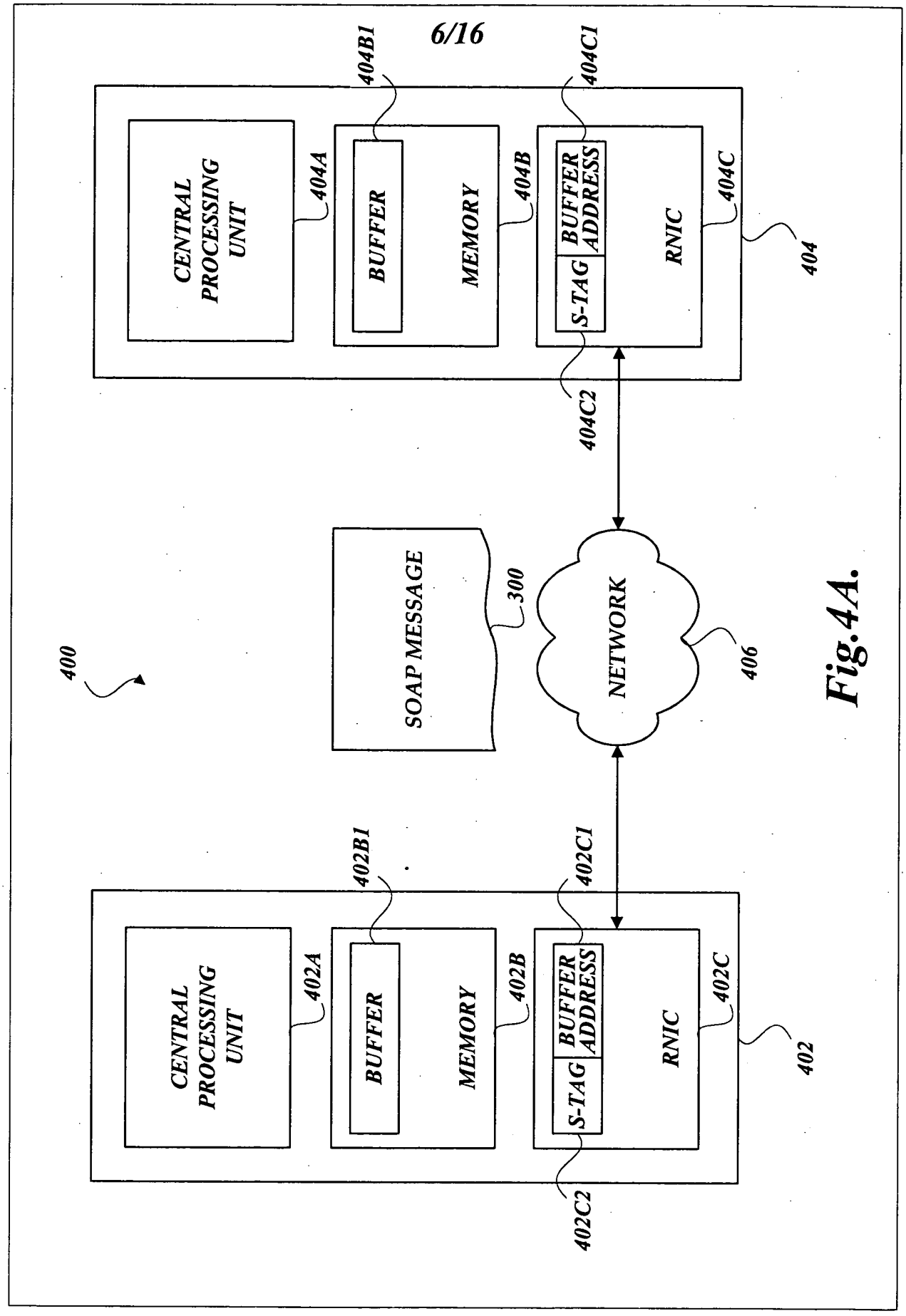
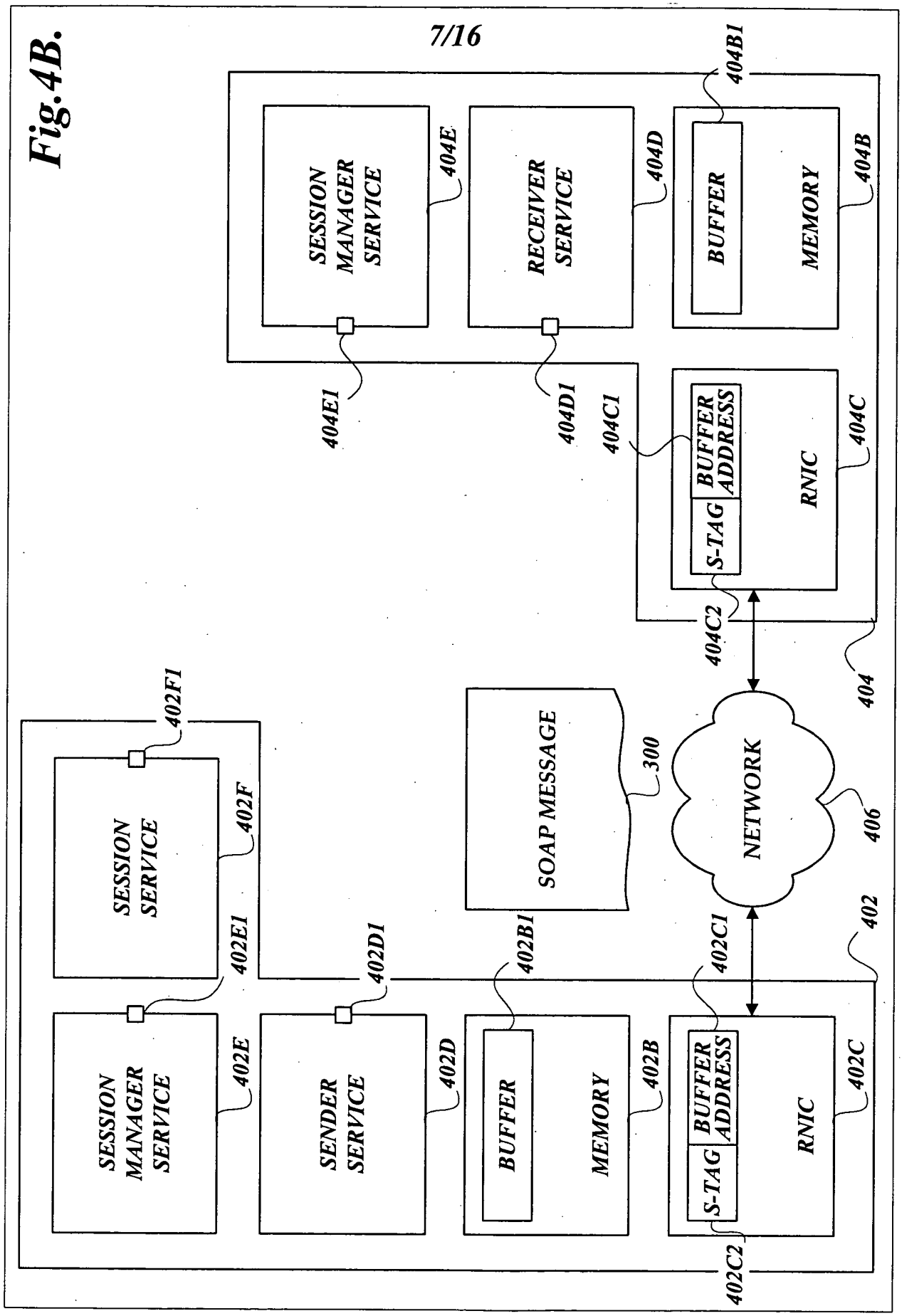

400
CENTRAL PROCESSING UNIT
404A
BUFFER
404B1
MEMORY
404B
S-TAG
BUFFER ADDRESS
404C1
RNIC
404C
404
404C2
SOAP MESSAGE
300
NETWORK
406
CENTRAL PROCESSING UNIT
402A
BUFFER
402B1
MEMORY
402B
S-TAG
BUFFER ADDRESS
402C1
RNIC
402C
402
402C2

Fig.4A.

Fig.4B.


SESSION MANAGER SERVICE
404E
RECEIVER SERVICE
404D
BUFFER
MEMORY
404B1
404B
404E1
404D1
404C1
S-TAG
BUFFER ADDRESS
RNIC
404C
404C2
404
SOAP MESSAGE
300
NETWORK
406
402F1
SESSION SERVICE
402F
402E1
402D1
402B1
402C1
402
SESSION MANAGER SERVICE
402E
SENDER SERVICE
402D
BUFFER
MEMORY
402B
S-TAG
BUFFER ADDRESS
RNIC
402C
402C2

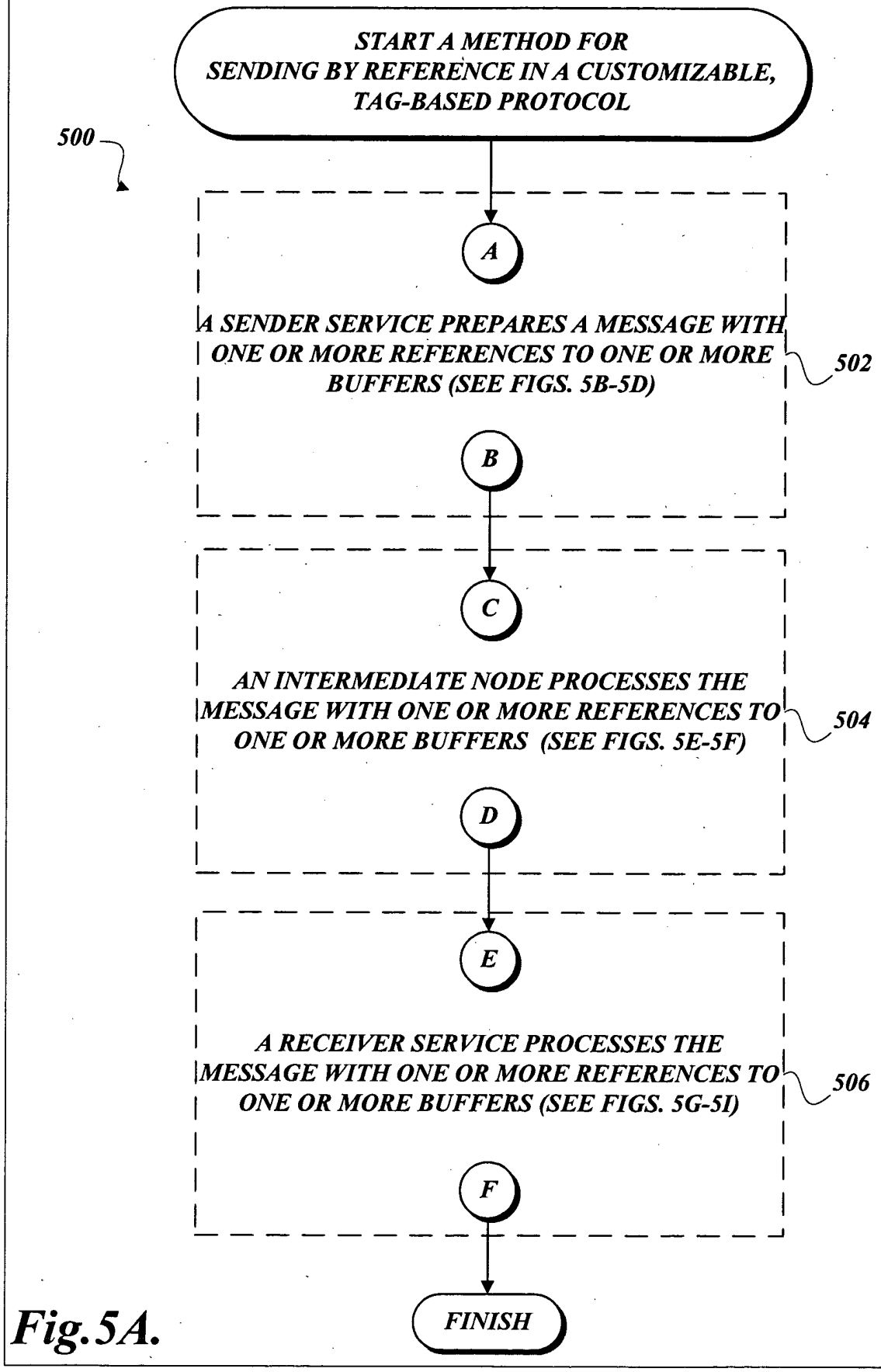

START A METHOD FOR SENDING BY REFERENCE IN A CUSTOMIZABLE, TAG-BASED PROTOCOL
500
A
A SENDER SERVICE PREPARES A MESSAGE WITH ONE OR MORE REFERENCES TO ONE OR MORE BUFFERS (SEE FIGS. 5B-5D)
502
B
C
AN INTERMEDIATE NODE PROCESSES THE MESSAGE WITH ONE OR MORE REFERENCES TO ONE OR MORE BUFFERS (SEE FIGS. 5E-5F)
504
D
E
A RECEIVER SERVICE PROCESSES THE MESSAGE WITH ONE OR MORE REFERENCES TO ONE OR MORE BUFFERS (SEE FIGS. 5G-5I)
506
F
FINISH

Fig. 5A.

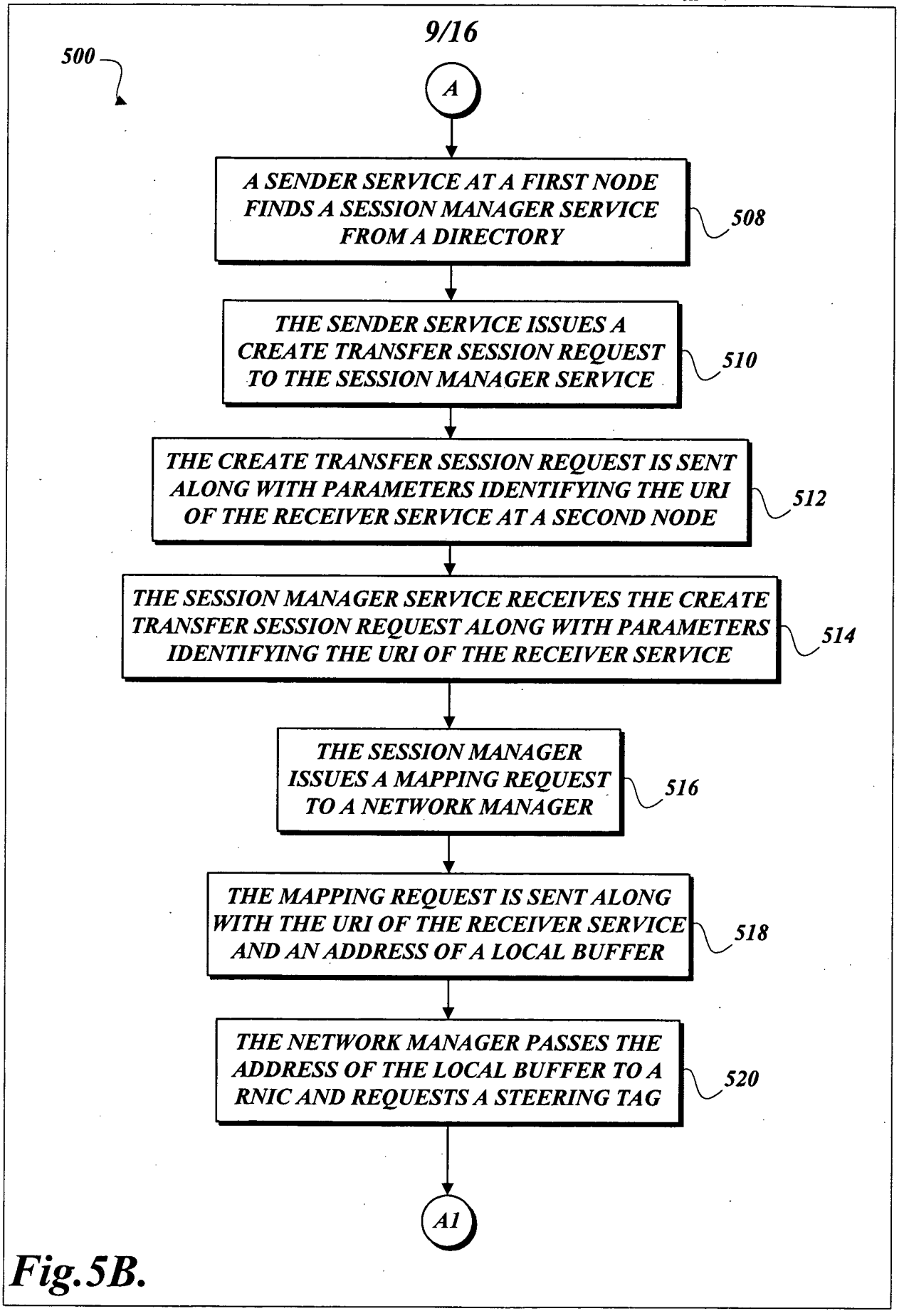

500
A
A SENDER SERVICE AT A FIRST NODE FINDS A SESSION MANAGER SERVICE FROM A DIRECTORY
508
THE SENDER SERVICE ISSUES A CREATE TRANSFER SESSION REQUEST TO THE SESSION MANAGER SERVICE
510
THE CREATE TRANSFER SESSION REQUEST IS SENT ALONG WITH PARAMETERS IDENTIFYING THE URI OF THE RECEIVER SERVICE AT A SECOND NODE
512
THE SESSION MANAGER SERVICE RECEIVES THE CREATE TRANSFER SESSION REQUEST ALONG WITH PARAMETERS IDENTIFYING THE URI OF THE RECEIVER SERVICE
514
THE SESSION MANAGER ISSUES A MAPPING REQUEST TO A NETWORK MANAGER
516
THE MAPPING REQUEST IS SENT ALONG WITH THE URI OF THE RECEIVER SERVICE AND AN ADDRESS OF A LOCAL BUFFER
518
THE NETWORK MANAGER PASSES THE ADDRESS OF THE LOCAL BUFFER TO A RNIC AND REQUESTS A STEERING TAG
520
A1

Fig.5B.

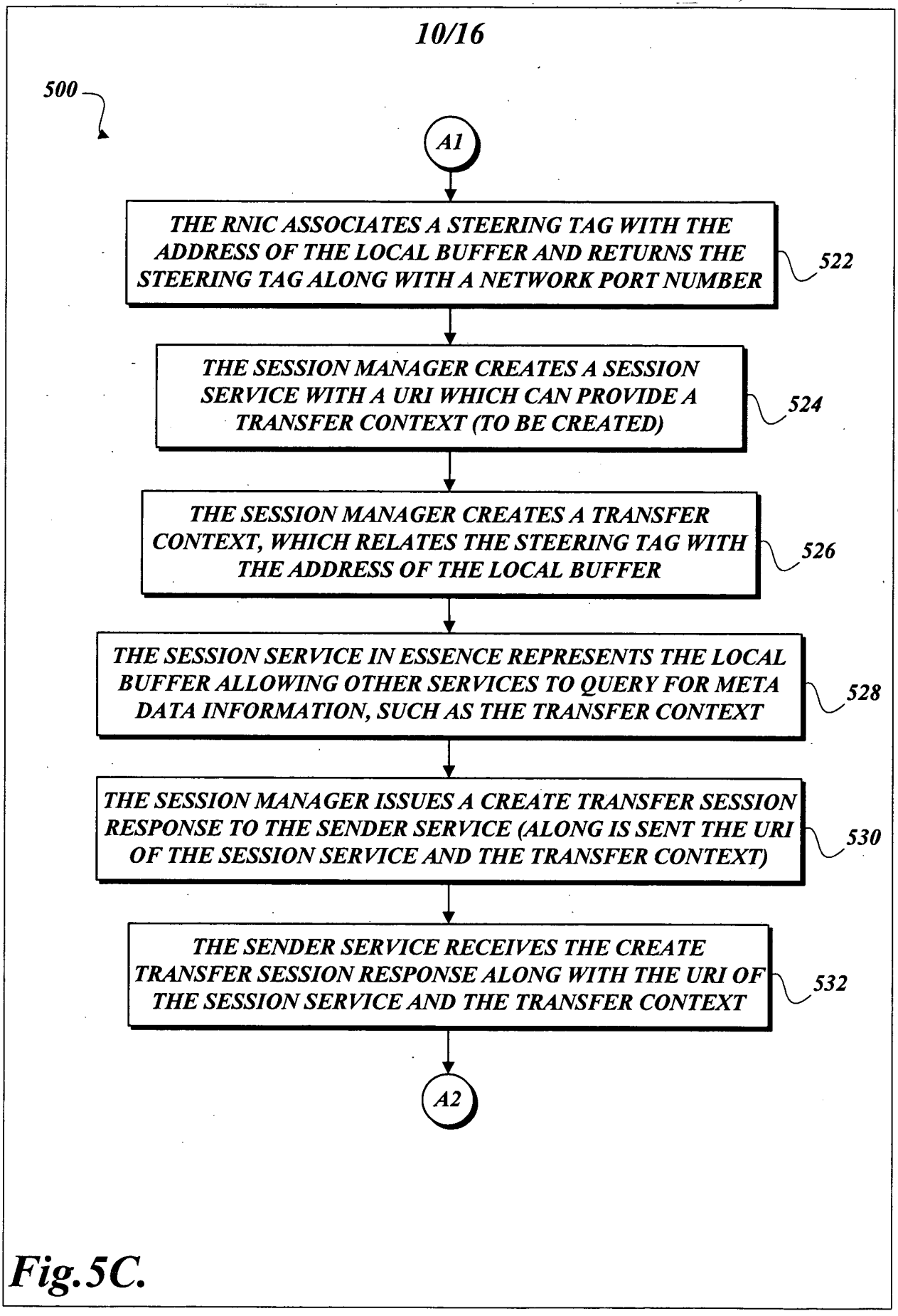

500
A1
THE RNIC ASSOCIATES A STEERING TAG WITH THE ADDRESS OF THE LOCAL BUFFER AND RETURNS THE STEERING TAG ALONG WITH A NETWORK PORT NUMBER
522
THE SESSION MANAGER CREATES A SESSION SERVICE WITH A URI WHICH CAN PROVIDE A TRANSFER CONTEXT (TO BE CREATED)
524
THE SESSION MANAGER CREATES A TRANSFER CONTEXT, WHICH RELATES THE STEERING TAG WITH THE ADDRESS OF THE LOCAL BUFFER
526
THE SESSION SERVICE IN ESSENCE REPRESENTS THE LOCAL BUFFER ALLOWING OTHER SERVICES TO QUERY FOR META DATA INFORMATION, SUCH AS THE TRANSFER CONTEXT
528
THE SESSION MANAGER ISSUES A CREATE TRANSFER SESSION RESPONSE TO THE SENDER SERVICE (ALONG IS SENT THE URI OF THE SESSION SERVICE AND THE TRANSFER CONTEXT)
530
THE SENDER SERVICE RECEIVES THE CREATE TRANSFER SESSION RESPONSE ALONG WITH THE URI OF THE SESSION SERVICE AND THE TRANSFER CONTEXT
532
A2

Fig.5C.

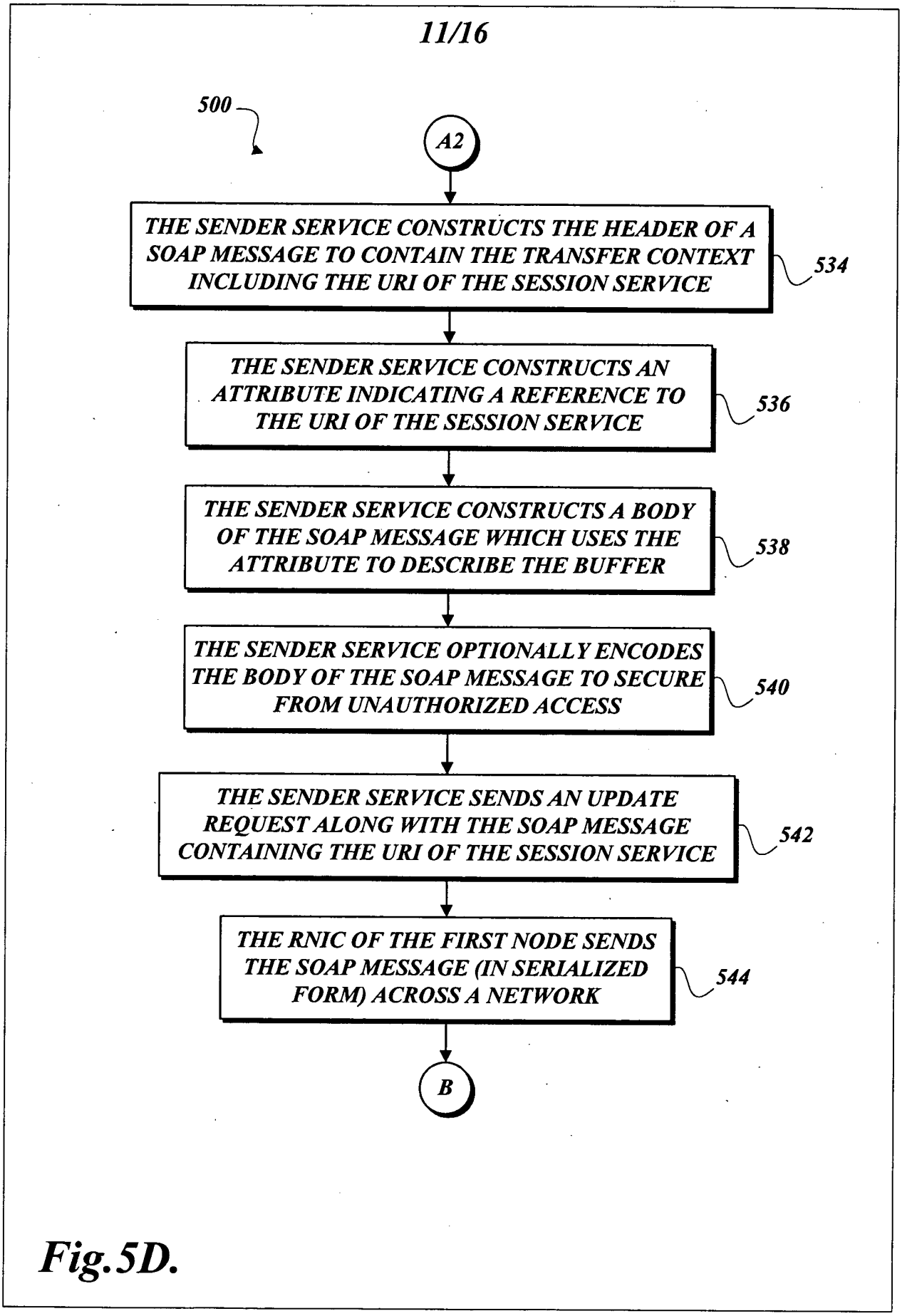

500
A2
THE SENDER SERVICE CONSTRUCTS THE HEADER OF A SOAP MESSAGE TO CONTAIN THE TRANSFER CONTEXT INCLUDING THE URI OF THE SESSION SERVICE
534
THE SENDER SERVICE CONSTRUCTS AN ATTRIBUTE INDICATING A REFERENCE TO THE URI OF THE SESSION SERVICE
536
THE SENDER SERVICE CONSTRUCTS A BODY OF THE SOAP MESSAGE WHICH USES THE ATTRIBUTE TO DESCRIBE THE BUFFER
538
THE SENDER SERVICE OPTIONALLY ENCODES THE BODY OF THE SOAP MESSAGE TO SECURE FROM UNAUTHORIZED ACCESS
540
THE SENDER SERVICE SENDS AN UPDATE REQUEST ALONG WITH THE SOAP MESSAGE CONTAINING THE URI OF THE SESSION SERVICE
542
THE RNIC OF THE FIRST NODE SENDS THE SOAP MESSAGE (IN SERIALIZED FORM) ACROSS A NETWORK
544
B

Fig.5D.

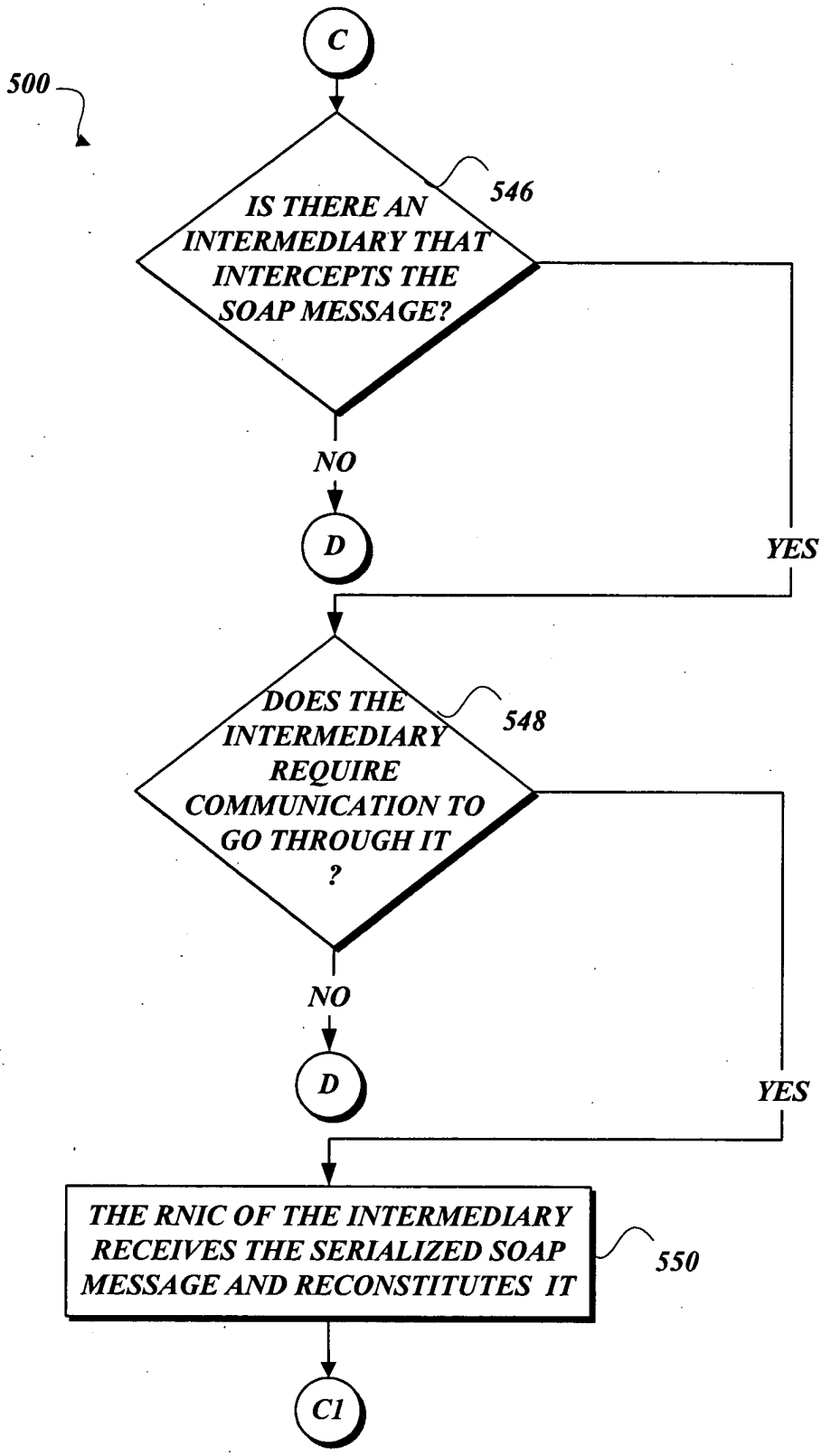

C
500
IS THERE AN INTERMEDIARY THAT INTERCEPTS THE SOAP MESSAGE?
546
NO
D
YES
DOES THE INTERMEDIARY REQUIRE COMMUNICATION TO GO THROUGH IT ?
548
NO
D
YES
THE RNIC OF THE INTERMEDIARY RECEIVES THE SERIALIZED SOAP MESSAGE AND RECONSTITUTES IT
550
C1

Fig.5E.

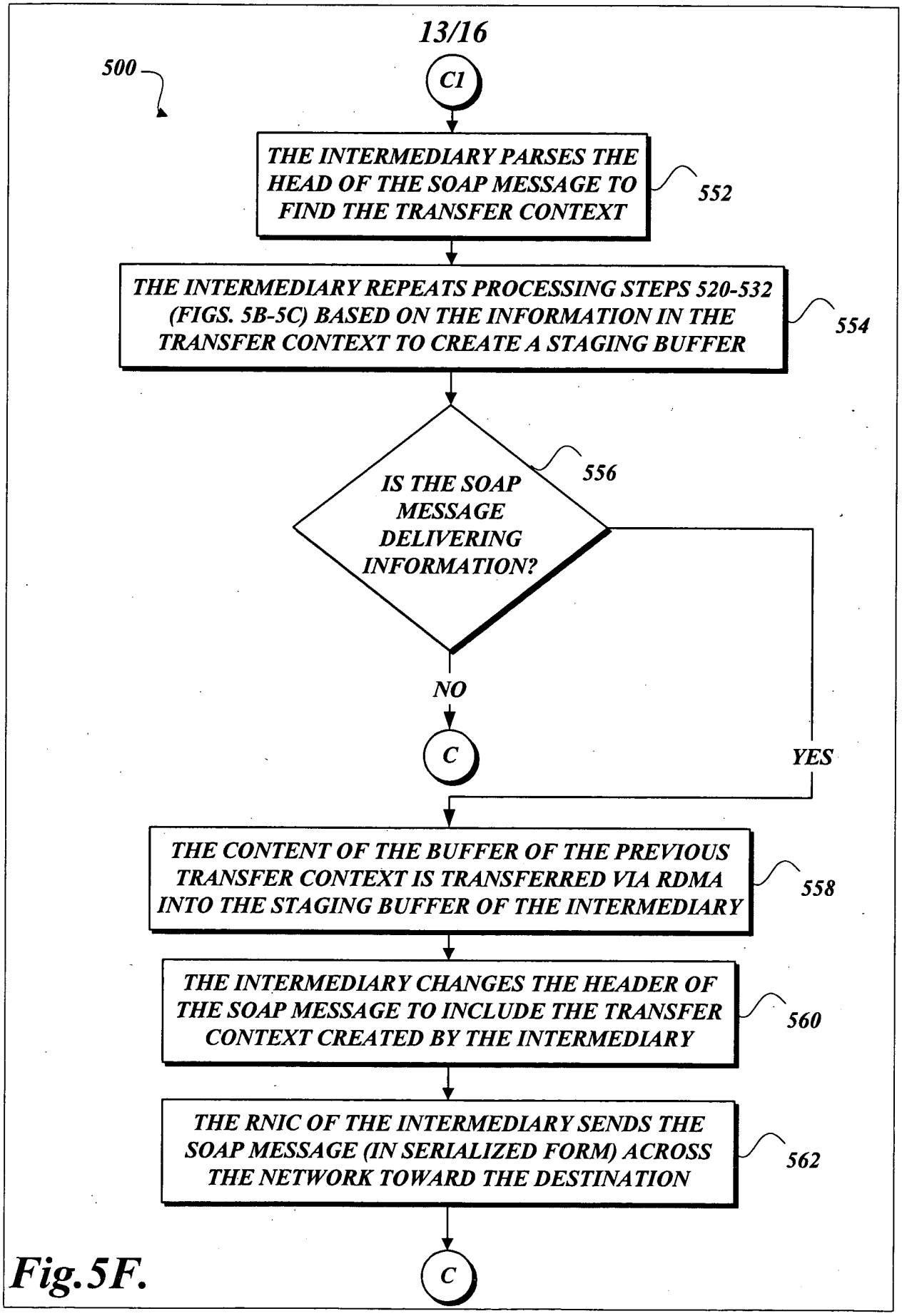

500
C1
THE INTERMEDIARY PARSES THE HEAD OF THE SOAP MESSAGE TO FIND THE TRANSFER CONTEXT
552
THE INTERMEDIARY REPEATS PROCESSING STEPS 520-532 (FIGS. 5B-5C) BASED ON THE INFORMATION IN THE TRANSFER CONTEXT TO CREATE A STAGING BUFFER
554
IS THE SOAP MESSAGE DELIVERING INFORMATION?
556
NO
YES
C
THE CONTENT OF THE BUFFER OF THE PREVIOUS TRANSFER CONTEXT IS TRANSFERRED VIA RDMA INTO THE STAGING BUFFER OF THE INTERMEDIARY
558
THE INTERMEDIARY CHANGES THE HEADER OF THE SOAP MESSAGE TO INCLUDE THE TRANSFER CONTEXT CREATED BY THE INTERMEDIARY
560
THE RNIC OF THE INTERMEDIARY SENDS THE SOAP MESSAGE (IN SERIALIZED FORM) ACROSS THE NETWORK TOWARD THE DESTINATION
562
C

Fig. 5F.

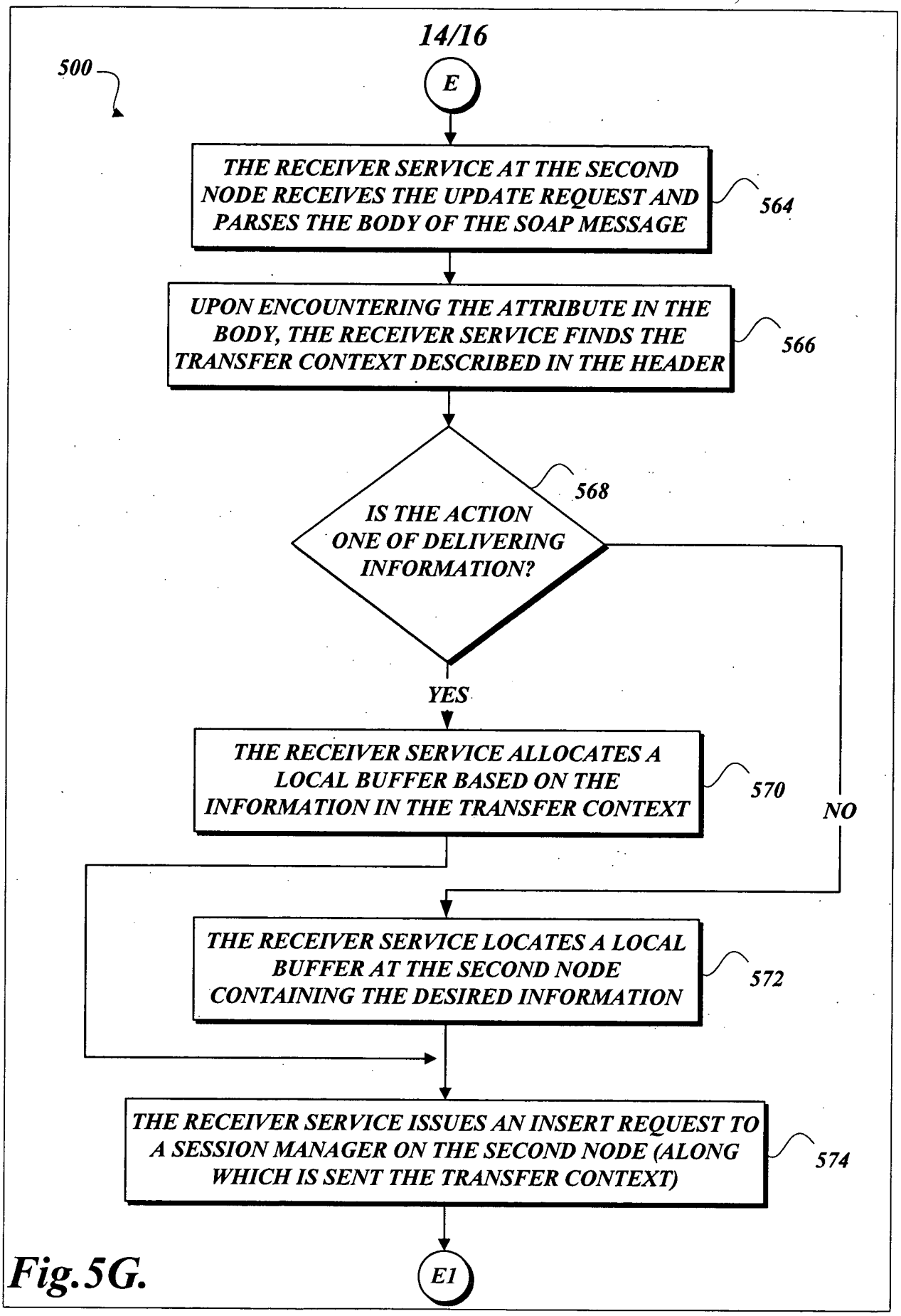

500
E
THE RECEIVER SERVICE AT THE SECOND NODE RECEIVES THE UPDATE REQUEST AND PARSES THE BODY OF THE SOAP MESSAGE
564
UPON ENCOUNTERING THE ATTRIBUTE IN THE BODY, THE RECEIVER SERVICE FINDS THE TRANSFER CONTEXT DESCRIBED IN THE HEADER
566
IS THE ACTION ONE OF DELIVERING INFORMATION?
568
YES
NO
THE RECEIVER SERVICE ALLOCATES A LOCAL BUFFER BASED ON THE INFORMATION IN THE TRANSFER CONTEXT
570
THE RECEIVER SERVICE LOCATES A LOCAL BUFFER AT THE SECOND NODE CONTAINING THE DESIRED INFORMATION
572
THE RECEIVER SERVICE ISSUES AN INSERT REQUEST TO A SESSION MANAGER ON THE SECOND NODE (ALONG WHICH IS SENT THE TRANSFER CONTEXT)
574
E1

Fig.5G.

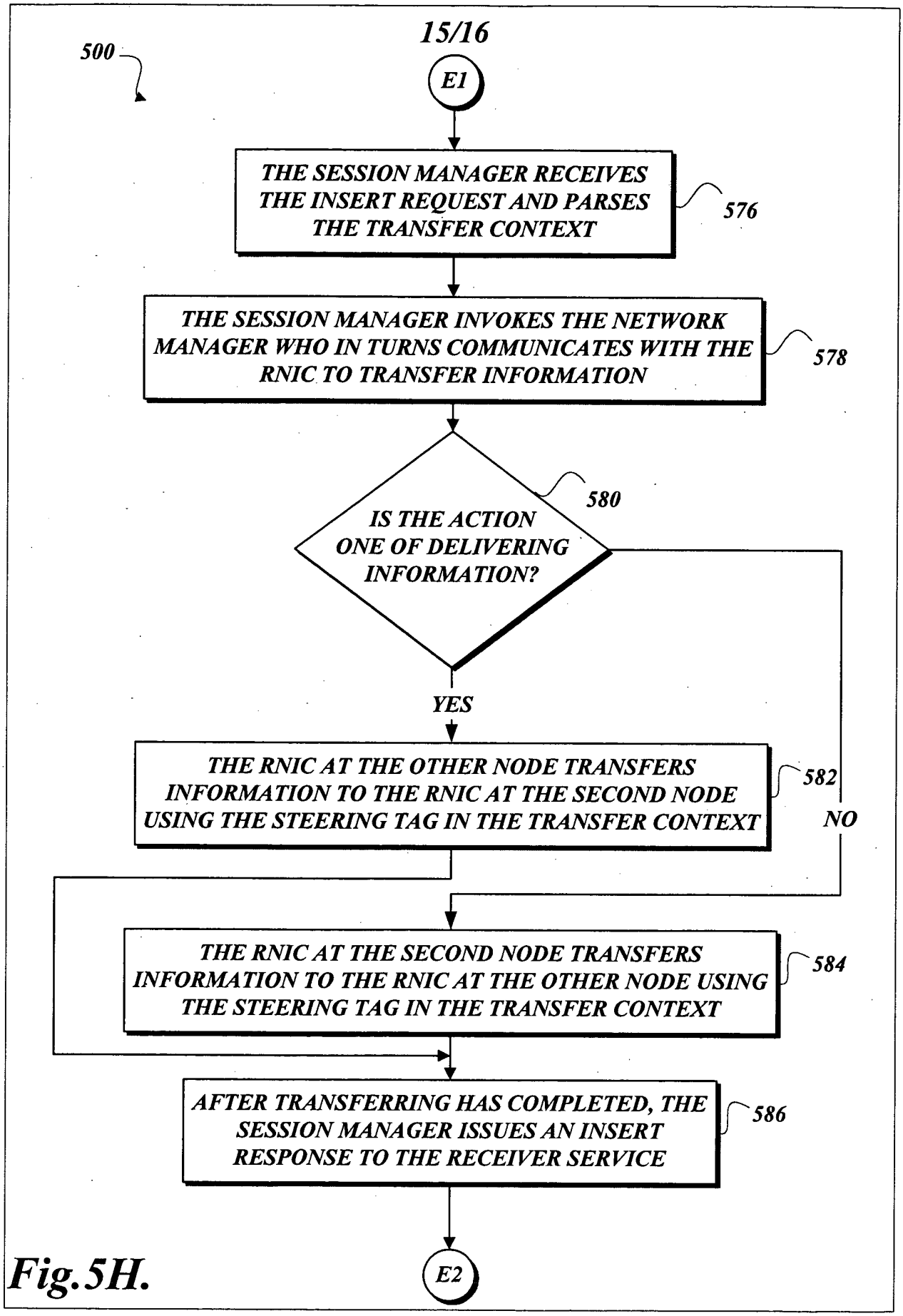

500
E1
THE SESSION MANAGER RECEIVES THE INSERT REQUEST AND PARSES THE TRANSFER CONTEXT
576
THE SESSION MANAGER INVOKES THE NETWORK MANAGER WHO IN TURNS COMMUNICATES WITH THE RNIC TO TRANSFER INFORMATION
578
IS THE ACTION ONE OF DELIVERING INFORMATION?
580
YES
NO
THE RNIC AT THE OTHER NODE TRANSFERS INFORMATION TO THE RNIC AT THE SECOND NODE USING THE STEERING TAG IN THE TRANSFER CONTEXT
582
THE RNIC AT THE SECOND NODE TRANSFERS INFORMATION TO THE RNIC AT THE OTHER NODE USING THE STEERING TAG IN THE TRANSFER CONTEXT
584
AFTER TRANSFERRING HAS COMPLETED, THE SESSION MANAGER ISSUES AN INSERT RESPONSE TO THE RECEIVER SERVICE
586
E2

Fig. 5H.

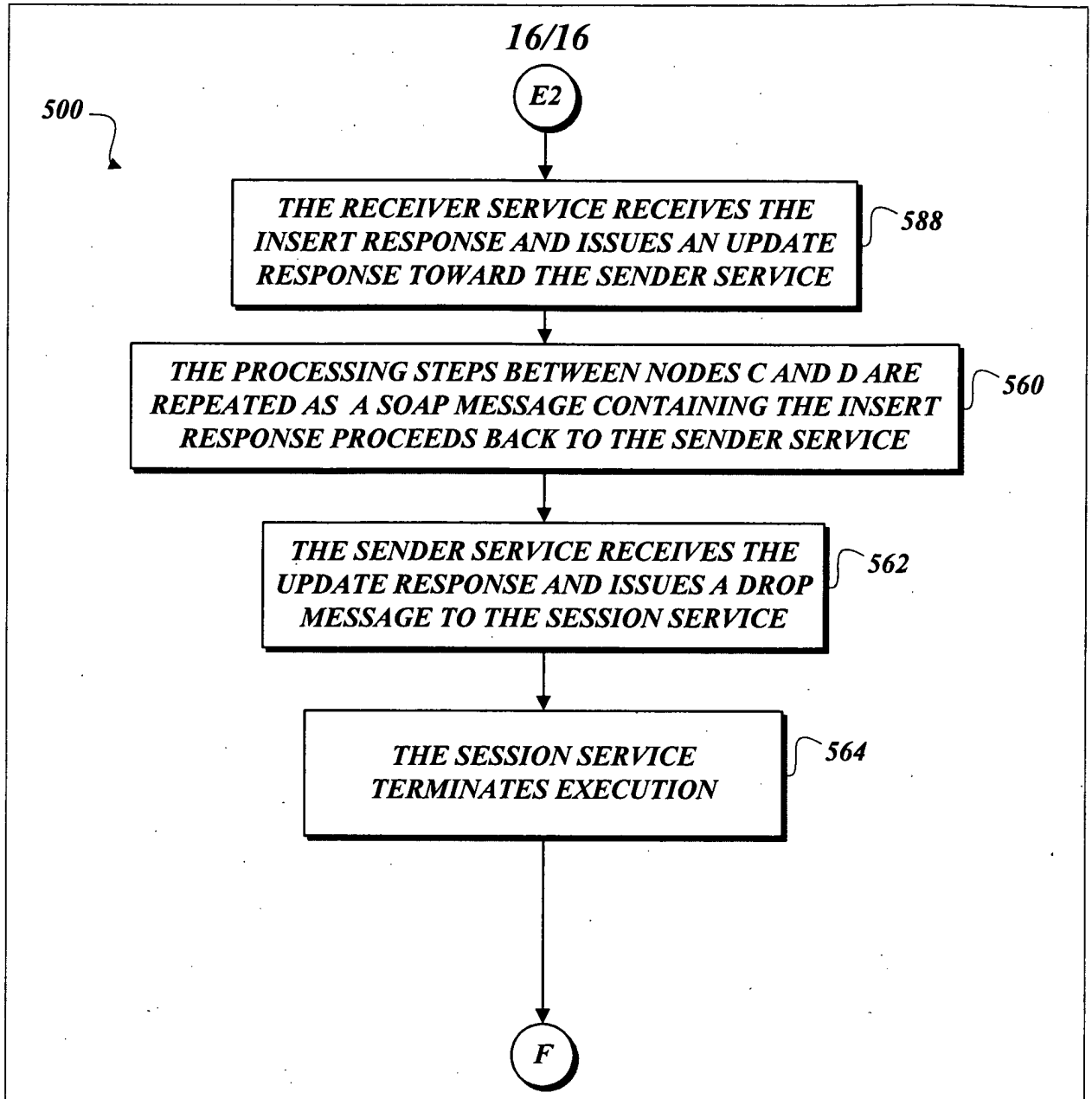

500
E2
THE RECEIVER SERVICE RECEIVES THE INSERT RESPONSE AND ISSUES AN UPDATE RESPONSE TOWARD THE SENDER SERVICE
588
THE PROCESSING STEPS BETWEEN NODES C AND D ARE REPEATED AS A SOAP MESSAGE CONTAINING THE INSERT RESPONSE PROCEEDS BACK TO THE SENDER SERVICE
560
THE SENDER SERVICE RECEIVES THE UPDATE RESPONSE AND ISSUES A DROP MESSAGE TO THE SESSION SERVICE
562
THE SESSION SERVICE TERMINATES EXECUTION
564
F

Fig.5I.